

U.S. NUCLEAR REGULATORY COMMISSION

Report No. 50-289/84-24
 Docket No. 50-289
 License No. DPR-50 Priority -- Category C
 Licensee: GPU Nuclear Corporation
Post Office Box 480
Middletown, Pennsylvania 17057
 Facility: Three Mile Island Nuclear Station, Unit 1
 Inspection At: Middletown, Pennsylvania
 Inspection Conducted: August 3 - September 7, 1984
 Inspectors: *E. Conner for* 10/9/84
 F. Young, Resident Inspector (TMI-1) date signed
W. Baunack 10/9/84
 W. Baunack, Project Engineer date signed
E. Conner for 10/9/84
 R. Conte, Senior Resident Inspector (TMI-1) date signed
E. Conner for 10/9/84
 J. Wechselberger, Resident Inspector (Oyster date signed
 Creek)
 Approved By: *E. Conner* 10/9/84
 E. Conner, Chief, Reactor Projects Section date signed
 No. 1B, PB No. 1

Inspection Summary:

Routine safety inspection by resident and region-based inspectors of licensee action on previous inspection findings; plant operations (shutdown mode) including Once Through Steam Generator (OTSG) tube repair, and maintenance activities. During a special maintenance inspection, including equipment malfunction analysis, review of job ticket records, and conduct of minor maintenance, one apparent violation was identified in the area of minor maintenance. In general, overall control and routine maintenance of the shutdown plant were good. The maintenance program has not substantially changed since the last review and improvements implemented subsequent to the TMI-2 Accident continue to be implemented. The licensee is proceeding methodically in proposing corrective action for the loose plugs in the Steam Generator. This is expected to be completed by October 1984.

The inspection involved 206 inspector hours.

DETAILS

1. Licensee Action on Previous Inspection Findings

(Closed) Inspector Follow Item (289/83-22-02): NRC Region I staff to review effectiveness of the "minor maintenance" system. This review was conducted and the review was documented in paragraph 3.5 along with applicable findings.

2. Plant Operations During Long Term Shutdown

2.1 Routine Review

The resident inspectors periodically inspected the facility to assess compliance with general operating requirements of Section 6 of the Technical Specifications (TS) in the following areas:

- licensee review of selected plant parameters for abnormal trends;
- plant status from a maintenance/modification viewpoint including plant cleanliness;
- licensee control of ongoing and special evolutions, including control room personnel awareness of these evolutions;
- control of documents including log keeping practices;
- implementation of radiological controls; and,
- licensee implementation of the security plan including access controls/boundary integrity and badging practices.

The inspectors reviewed the following specific items:

- Random inspections of the control room during regular and back shift hours were conducted which included selected sections of the shift foreman's log and control room operator's log for the period August 3 - September 7, 1984, and selected sections of other control room daily logs for the period from midnight to the time of review;
- Inspections of areas outside the control room occurred on: August 6, 7, 9, 10, 14, 16, 21, 22, 23, 29, 30, 31 and September 4, 5, 7; and,
- Selected licensee planning meetings.

No violations were identified.

2.2 Steam Generator Tubes - Rolled Plug Repairs

The NRC Inspection Report 50-289/84-20 updated information on the corrective actions related to abnormal leakage identified in June 1984 and addressed a new problem with the Westinghouse Rolled Plugs used to plug OTSG tubes on a temporary basis. Five plugs apparently came loose from the A and B OTSG lower tubesheets and were missing (assumed to be in the Reactor Vessel). During this inspection, the inspector reviewed licensee activities regarding pull testing of the remaining rolled plugs.

Prior to the pull test period August 15 - 27, the licensee contracted with Westinghouse Corporation, to develop a pull test procedure with appropriate acceptance criteria based on empirical laboratory data obtained in August 1984. This was completed by Westinghouse to support a safety evaluation for the pull test inspection/evaluation activity (JT CE 528, dated August 13, 1984). Pull testing was completed between August 15 and 27, 1984 with the following results. Of approximately 1006 plugs tested, 25 pulled out completely, 253 moved out slightly (in the order of mils) and 728 were acceptable. The licensee in conjunction with Westinghouse, concluded that repairs will be needed for those plugs which moved slightly. Also, it was not determined what type of replacement plugs would be used for the 25 that pulled out completely. Westinghouse is to conduct additional testing and make modifications to the installation tooling. The licensee and Westinghouse tentatively concluded that certain process installation variables were not limited to assure the required roll torque on the previously installed plug.

Also, during pull testing, the licensee reported that another plug in the A OTSG lower tubesheet was found missing (total four missing in the A; two in B). Apparently this missing plug was overlooked in the licensee's previous verification on tube plugging status.

On several occasions, the inspector witnessed the actual work performed in the Reactor Building. Field Test Procedures were reviewed at the job site and were found to be consistent with a 10 CFR 50.59 Safety Evaluation Report (SER), which was issued by the licensee on this subject. The procedure was found to have provisions for calibration of test equipment. Procedure responsibilities were delineated and were clear as to vendor/licensee duties. Discussions with the licensee about the program indicated ALARA principles were used, such as use of video equipment for tube location verification. In addition, the inspector noted that there was extensive Quality Control (QC)/QA involvement and coverage at the job site.

This item will continue to be further reviewed in subsequent NRC inspection.

2.3 Other Maintenance Modification Activities

Selected maintenance activities were reviewed to verify that:

- Documentation was complete and accurate to support the work actually accomplished;
- Procedures and testing were appropriate to the repair circumstances;
- There was coverage by QA/QC Department; and
- Personnel were knowledgeable in their work.

The below listed maintenance/modification activities were reviewed:

- OTSG Tube Rolled Plug Pull Tests and associated procedures (JT CE 528, dated August 13, 1984 and contractor procedures SAE-SGSE-FP-6884 Field Charge No. 1, dated August 13, 1984).
- Reactor Coolant System (RCS) Inventory Trending System (Reactor Water Level) Installation Walkdown.
- Decay Heat Vibration Monitor Terminal Box Movement.
- Decay Heat Valve DH-V64 extension rod installation.

No discrepancies were noted.

2.4 Summary

Based on this sampling review of the various licensee activities noted above, the inspector did not identify any conditions adverse to nuclear safety or regulatory requirements. Personnel stationed in the control room presented a posture of overall control of daily activities, including problem areas that needed resolution. The planning meetings indicated an attempt to proceed safely with daily activities, including surveillance and maintenance, and to resolve any inter-department interface problems. Licensee upper management continued their detailed involvement in site activities. No violations were identified.

3. Maintenance Program Review

3.1 Scope of Review

The inspectors reviewed selected sections of the below listed references (paragraph 3.2) and interviewed key maintenance department personnel to assess how the licensee's maintenance program implements the following:

- Compliance (sampling basis) with the following major sections of ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants: 5.2.3, Special Orders; 5.2.6 Equipment Control; 5.2.12, Records; 5.2.13.1, Procurement; 5.2.17, Inspection; 5.2.7, Use of Procedure and Preventive Maintenance Program; and 5.3.5, Maintenance Procedures;
- Compliance with ANSI N18.7, Section 5.2.7 on the cause of malfunctions. This was a detailed review to verify: (1) equipment failures were evaluated by the licensee for frequency and root cause (2) maintenance errors were detected, evaluated, and corrected, including root cause and (3) record systems permitted the above evaluations; and
- Maintenance procedures were properly established, implemented and maintained in accordance with TS 6.8.1 and 6.8.2 (sampling basis).

3.2 References

- Administrative Procedure (AP) 1026, Revision 14, May 4, 1984, "Corrective Maintenance and Machinery History."
- AP 1027, Revision 12, September 15, 1983, "Preventive Maintenance."
- Maintenance Procedure (MP) 1407-1, Revision 20, July 30, 1984, Unit 1, "General Corrective Maintenance Procedure."
- MP 1407-3, Revision 1, April 23, 1984, "Assessment of the Adequacy of the Preventive Maintenance Program."
- MP 1407-4, Revision 0, November 14, 1983, "Lubrication Analysis Program."
- TMI-1 Mechanical (Electrical, Utility) Maintenance Department on the Job Training Manual.
- All effective Maintenance Department Orders per Index, dated August 1, 1984.
- 12 OQA Monitor Reports for April - May 1984 in the Maintenance area.
- Audit File No. S-TMI-84-01, dated April 5, 1984, for period January 12 - 26, 1984 and related licensee internal correspondence.
- MP 1410-V-14, Revision 7, August 22, 1984, "To adjust, add packing to or repack valves in Borated Water Systems."

- MP 1410-V-13, Revision 5, August 2, 1984, "To adjust add packing to or repack valves."
- MP 1430-RMS-8, Revision 2, July 17, 1980, "Calibrate Repair RMS Reorder."
- MP 1430-N-11, Revision 5, August 8, 1984, "Repair/Calibration of Various Instrumentation Recorders."
- MP 1430-N-4, Revision 5, June 19, 1984, "Tightening and/or replacing Tubing and Fittings."
- Minor Maintenance Job Tickets (JT) for Various Plant Building JTs CB 325 to 330, dated July 13, 1983 and JTs CD 042 to 048, dated January 18, 1984
- Selected Completed Job Tickets for period 1983 - 1984 associated with important to safety systems.

3.3 Equipment Malfunction Analysis

The licensee's Maintenance Procedures (MP) 1407-3, "Assessment of the Adequacy of the Preventive Maintenance Program," Revision 1 and AP 1027, "Preventive Maintenance," Revision 12, apply, in part, to the subject of this review. The licensee's adherence to these procedural requirements was verified. In addition, discussions were held with Plant Maintenance and Plant Engineering personnel to gain insight into their involvement with the evaluation of maintenance activities. Daily work planning meetings, post-job critiques, maintenance of equipment history, equipment failure trending, and a preventive maintenance program are among the procedural requirements. The facility procedures are detailed, in compliance with the requirements of ANSI N18.7-1976, and adequate to provide a proper review and evaluation of maintenance activities.

A random sampling of several hundred completed job tickets and discussions with licensee personnel were conducted. It indicated that repeated failure or test failures do occasionally occur and that these are usually identified by plant engineering and/or maintenance personnel as the trends develop. If the trends are not identified at this time, the trend would be identified during procedurally required quarterly review of all completed job tickets.

A review of the quarterly reports assessing equipment failure trends was conducted. The reports were found to be thorough and complete. The reports were identifying trends and were generating action items for responsible individuals, to determine the root cause and propose corrective actions as appropriate. The inspector did note that the review was being performed on a system basis as opposed to on a component level. The licensee acknowledged this comment and stated

that component trending would eventually be done by Nuclear Power Reliability Data System (NPRDS), as that data base becomes large enough to identify trends on a component level. Discussions with Plant Engineering staff indicated that most lead engineers were informally tracking failures of components.

In general, the program was able to identify trends early on and take positive steps to correct the problem. The general attitude of personnel contacted, who are associated with the conduct of maintenance, is one of familiarity with the system and a desire to adhere to procedural requirements.

3.4 Review of Job Ticket Records

Overall, the Job Tickets were generally well-prepared and properly filled out. However, the inspectors did note two isolated deficiencies associated with completed forms.

Job Ticket CB 843 (dated September 5, 1983) was written to replace a 3000 psi local pressure gauge with a 1000 psi gauge (original design). The gauge was installed in the system on September 30, 1983. The gauge is located at the discharge of the positive displacement pump taking suction on the chemical addition tank. The pump discharges to the core flood tanks. The replacement gauge was a commercial grade, non-QC gauge. An engineering evaluation was requested on March 27, 1984, to approve and upgrade this gauge to QC standards for use in this system. The evaluation was completed April 17, 1984.

Discussions with the licensee indicated the engineering evaluation should have been completed prior to installation of the gauge to prevent equipment changes in an important to safety system without first having the benefit of an engineering evaluation. This should be positively controlled so that a recurrence does not happen. The licensee acknowledged the inspector's concerns. Independent review by the inspector determined that the replacement with the new gauge did not adversely effect safety and reliability of the system.

Review of the job tickets also revealed an inconsistency on how shift foremen/supervisors were signing off the release of the equipment to maintenance. The job ticket signoff indicates "...shift foreman's approval to commence work. When required, approval shall be given only if an inspection has been performed to verify redundant strings of safety related equipment." Clearly this applies to nuclear safety related equipment and the inspectors found that the shift foremen were implementing this requirement for that type of equipment. Inconsistencies were noted (some foremen signed; some did not) for maintenance on equipment in the broader classification, important to safety; but not nuclear safety related. The MP 1407-1 is not clear on how this section of the job ticket is to be completed.

Licensee Maintenance Manager acknowledged the above finding and agreed to review the MP for clarifications in this regard. This is unresolved pending completion of licensee action as noted above and subsequent NRC Region I review (289-84-24-01).

3.5 Conduct of Minor Maintenance

In late 1982, the licensee issued a Maintenance Department Order (MDO) (Standing or Special Order) to implement the use of a Minor Maintenance Work Form in lieu of the Job Ticket system for the conduct of minor maintenance. The licensee's intentions were to correct minor problems before they become major equipment problems and to increase the efficiency of the work force by minimizing the paper work to be completed for minor jobs. The MDO defined minor indirectly by the use of personnel qualification sheets which listed types of minor jobs. The signoff blanks on the qualifications, when completed, indicated that the individual was qualified to do that particular minor maintenance job (having the necessary skills to do the job). This methodology was not implemented until July 1983. However, about the same time, an NRC inspector identified that the MDO was not addressed in Corrective Maintenance Procedure 1407-1 in accordance with ANSI N18.7-1976, thus the new system would not get proper independent technical and safety review in accordance with T.S. 6.8.1 and 6.8.2. The licensee incorporated the MDO into MP 1407-1 as noted in NRC Inspection Report 50-289/83-22. The inspector identified an open item (289/83-22-02) for the NRC Region I to review the effectiveness of this new methodology, because minor maintenance could be accomplished on important to safety systems which include nuclear safety related systems.

Below are the programmatic and implementation problems identified during this review along with an overall conclusion on effectiveness.

The inspector reviewed the minor maintenance methodology to assure the programmatic requirements of ANSI N18.7-1976 were implemented. Many minor activities such as repacking a pump or valve or an instrument calibration on important to safety systems would necessitate making the equipment inoperable even though for only a short period of time. The minor maintenance work form does not provide measures to assure the operations department documented release of the equipment for maintenance, contrary to ANSI N18.7, paragraph 5.2.6. This applies even if the equipment is not taken out of service.

The work form also does not provide for traceability of materials on replaced parts, contrary to ANSI N18.7, 1976, paragraph 5.2.13.3. The original form had provisions for documenting applicable purchase order numbers, but for some reason, that provision was deleted.

When the minor work is planned, the work form does not provide for specific post maintenance test acceptance criteria, contrary to ANSI N18.7, paragraph 5.2.19.3.

Finally, the work form does not provide for documenting what generic maintenance procedure was either committed to memory or used at the job site during the performance of the minor work activity.

As a result of the above noted inadequacies, the inspector identified several implementation problems. During late 1983 and early 1984, the minor maintenance method was used for various packing adjustments to valves containing borated water, especially for the reactor coolant system. The visual inspection of the valve and results were not documented as required by MP 1410-V-14. The valve leakage criteria, to be obtained from the vendor service manual, was also not identified on the work form. For other jobs reviewed such as the tightening of fittings, recorder calibration, etc., it was not clear which generic maintenance procedure was used or committed to memory to perform the task. Further, the machinery history entries for the minor maintenance work were duplications of the Blanket Job Ticket information that covered the various plant building for the individual years (e.g., 1983). The documentation on these job tickets lacked the details of what work was done on specific components; therefore, precluding the ability to analyze repetitive type malfunctions on a particular piece of equipment. This was contrary to MP 1407-1, paragraph 7.3.4, which requires that the information on the minor maintenance work form be entered into Generation Maintenance Computer System (machinery history).

Maintenance department managers acknowledged the above findings but they responded by saying that minor tasks which required equipment to be taken out of service was conducted by job tickets. The inspector verified that this implied policy (not documented) was being implemented at least for repacking jobs. The inspector also noted other work was conducted by the minor maintenance form which would necessitate the equipment to be out of service, such as recorder repairs on the Radwaste Panel. It was noted that shift supervisors were aware of minor maintenance which was being conducted by receiving a copy of the weekly work schedule.

Further discussions with licensee representatives revealed that a good deal of review went into formulating the minor maintenance methodology which included seeking the advice of the QA Department. The licensee's intentions in this area were good and results had probably contributed to a better state of cleanliness in the plant, especially with respect to valve packing leakage adjustments. However, the inspector concluded that the licensee's independent technical and safety review of Revision 16 to 1407-1, dated August 23, 1983, was not adequate, in part, to detect the above noted failures to comply with ANSI N18.7-1976. Implementing this new methodology appears to have contributed to the certain nonadherences noted above. This represents a violation of TS 6.81, 6.8.2 and 6.5.1.1 collectively (289/84-24-02).

3.6 Overall Conclusion on the Maintenance Program

Overall, the maintenance program, represented by the job ticket system, has not substantially changed since the last review in the area. The improvements implemented subsequent to the TMI-2 Accident and as noted in the TMI-1 Restart Hearing, continue to be implemented. There appears to be considerable effort spent by the maintenance manager to assure detailed documentation of the resolution of the job tickets. Supplemental sheets for job ticket resolution are frequently used. Noted Engineering Evaluations indicate a good deal of involvement by the Plant Engineering Department. A system is in place to trend equipment malfunctions, but improvements can be made intruding problems with components which are used in multiple systems.

The recently instituted minor maintenance system is a good initiative on the part of the licensee and is contributing to the licensee's housekeeping efforts and equipment readiness aspects. However, a more detailed review of this system prior to initiation was warranted to ensure the system met ANSI commitments.

4. Exit Interview

The inspectors met periodically with the licensee representatives to discuss the inspection scope and findings. Exit interviews were conducted on August 31 and September 7, 1984, and the inspector summarized the inspection findings to the following exit meeting attendees:

- H. D. Hukill, Director and Vice President, TMI-1
- S. Otto, Licensing Engineer, Technical Functions Division (TFD)
- J. Pfadenhauser, Operations Quality Assurance Supervisor, Nuclear Assurance Division (NAD)
- D. M. Shovlin, Manager Plant Maintenance, TMI-1
- C. W. Smyth, TMI-1 Licensing Manager, TFD
- M. G. Snyder, Preventive Maintenance Manager, TMI-1
- R. J. Toole, Operations and Maintenance Director, TMI-1